

ISS –How Big, How Fast, How Long, and How Cool
is the International Orbiting Science Laboratory

**ISS hardware on orbit since
November/December 1998
(17 yrs, 301 days)**

**Permanently occupied since
November 2000**

(15 yrs, 309 days)

**Current altitude - 401 km perigee,
405 km apogee (~250 miles)**

**Orbital velocity – 7.66 km/s (17,100
mph)**

Orbital period – 92.69 minutes

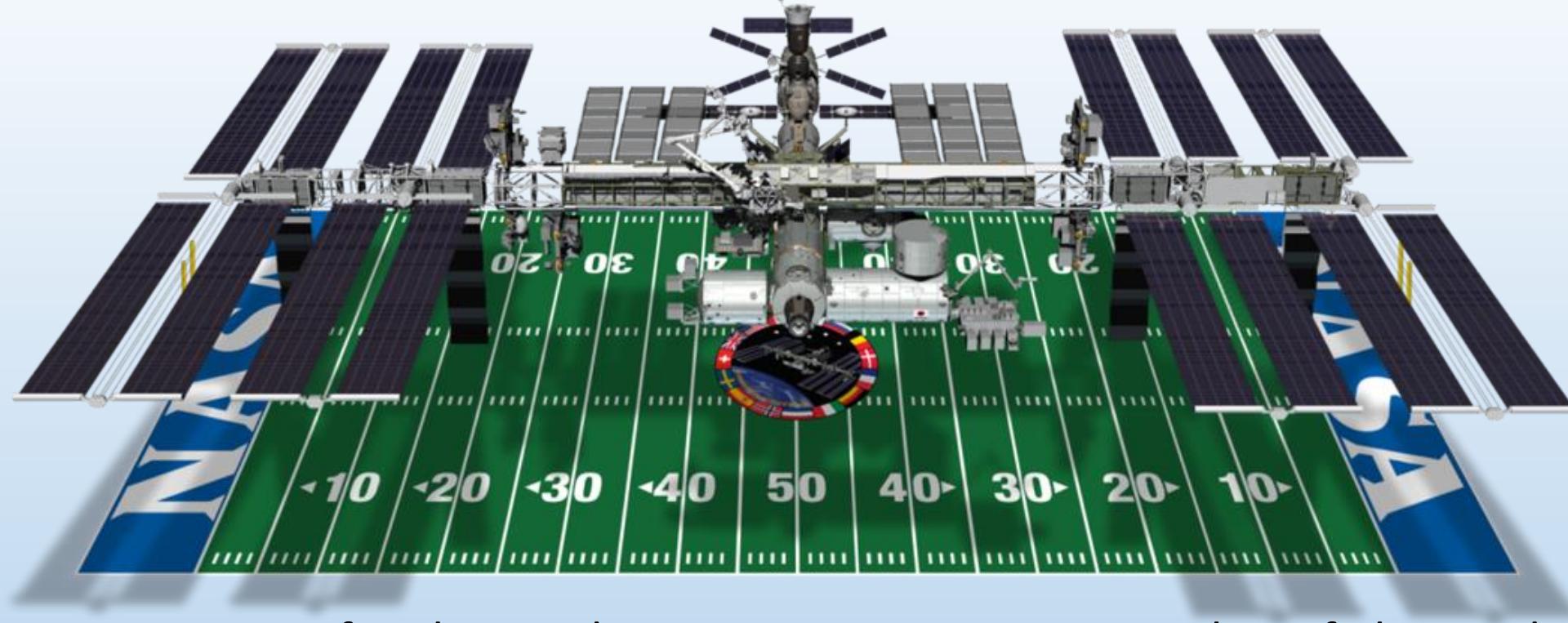
**Passed the 100,000 orbit milestone
May 2016**

Orbital inclination – 51.6 degrees

**Visible with naked eye from most of
the globe**

Visible magnitude can be as high as -4





ISS solar arrays are 240 feet long – the 8 arrays can generate ~84 kW of electrical power

Solar array surface is almost one acre of area

ISS truss length is 357 feet – pressurized module length is 240 feet

Pressurized volume ~ 33,000 cubic feet (equivalent to a 6 bedroom house)

Mass is ~ 1,000,000 lbs

Controlled by 52 computers running roughly 2.3 million lines of code

105 MIL-STD-1553B data busses plus payload Ethernet and Wireless connections

CREATED BY 5 SPACE AGENCIES REPRESENTING 15 NATIONS



Canadian Space Agency



European Space Agency



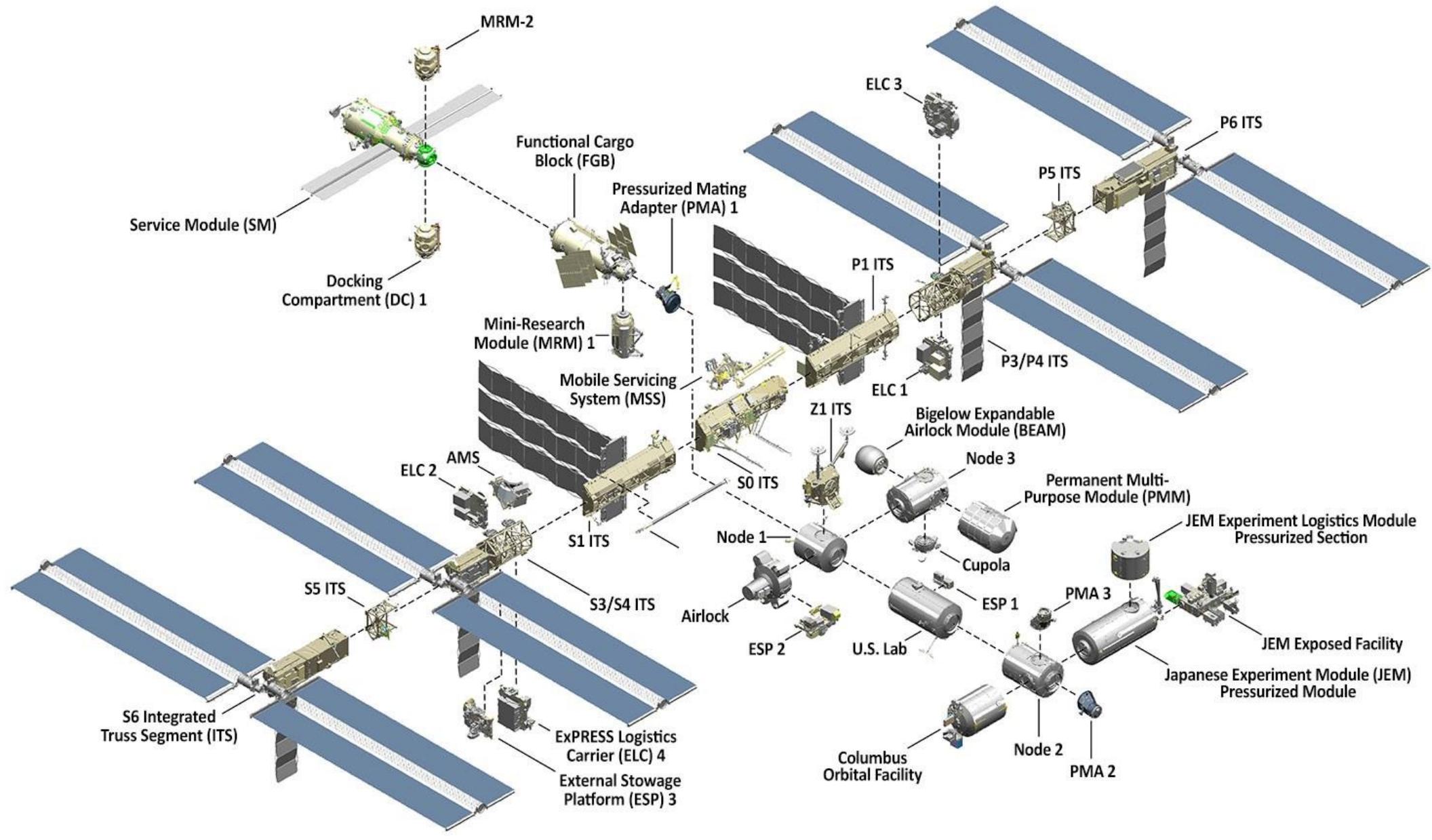
Japan Aerospace Exploration Agency



National Aeronautics and Space Administration

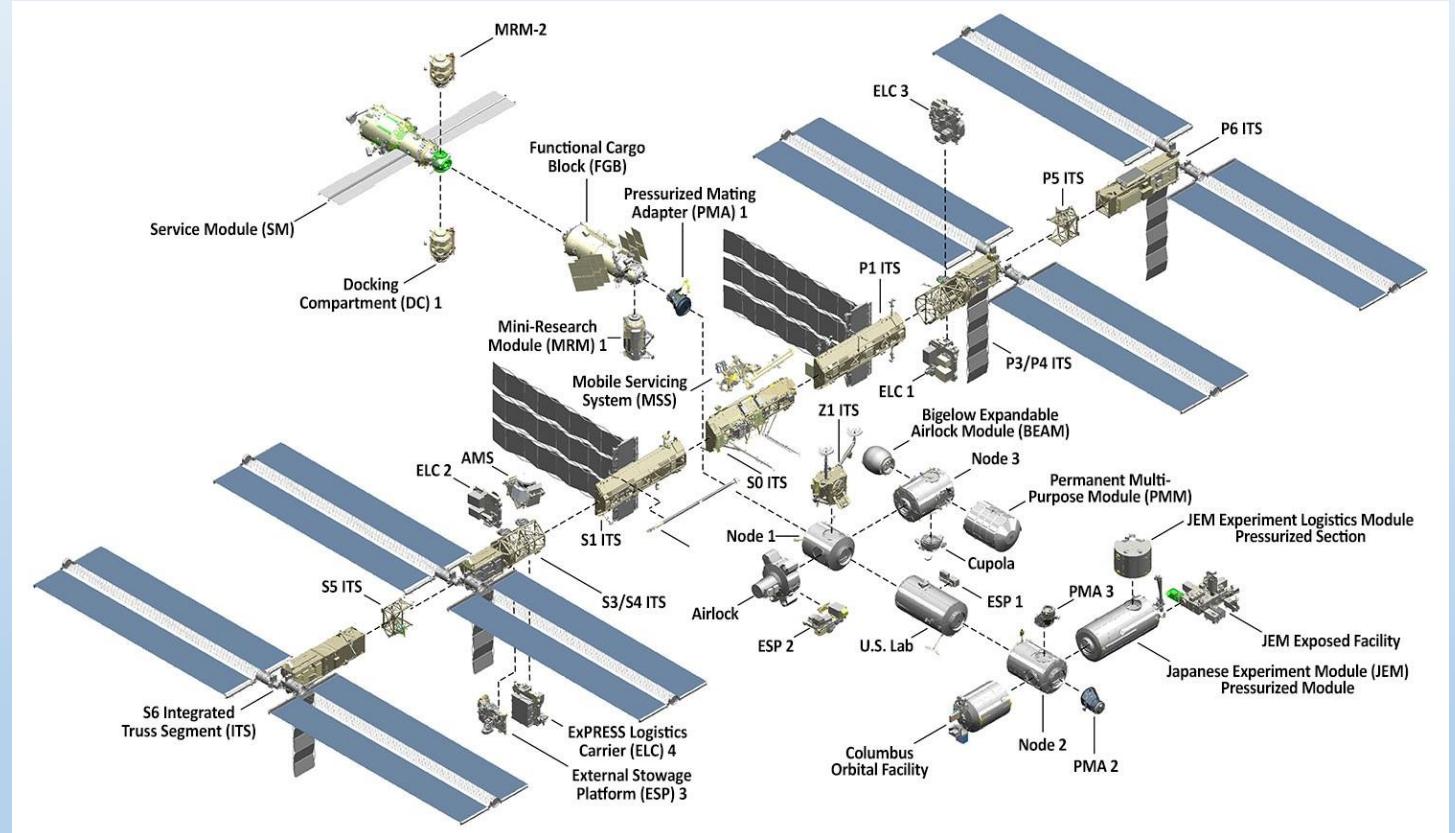


Russian Federal Space Agency



Construction

Constructed using 37 Shuttle flights and 5 Russian flights



Construction

Flight 1A/R – November 1998



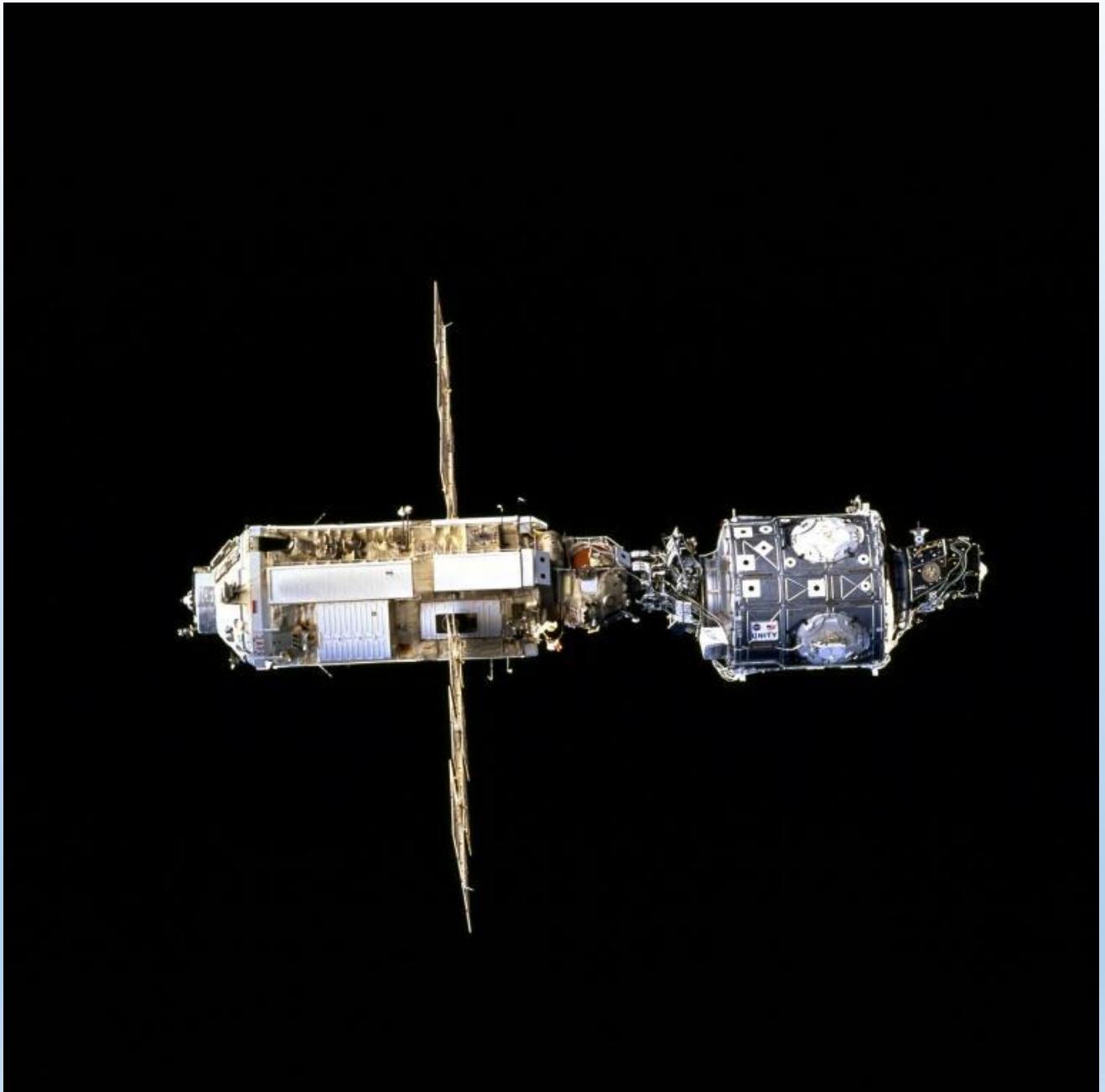
Construction

Flight 1A/R – Zarya (FGB)

November 1998

Flight 2A – Unity (Node 1)

December 1998



Construction

Flight 1A/R – Zarya (FGB)

November 1998

Flight 2A – Unity (Node 1)

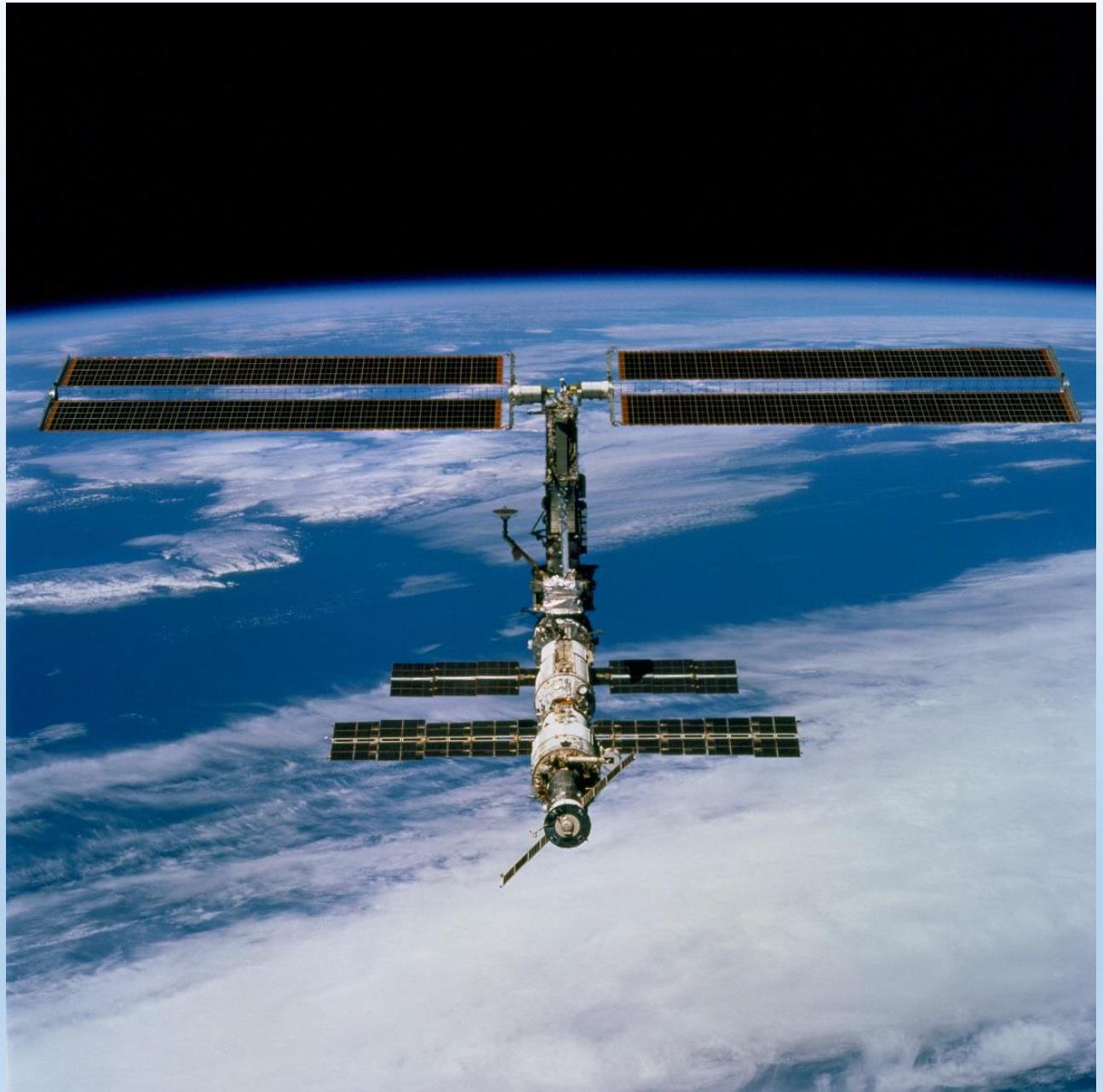
December 1998

Flight 1R – Zvezda (Service
Module)

July 2000

Flight 4A – P6 Truss

December 2000



Construction

Flight 1A/R – Zarya (FGB)

November 1998

Flight 2A – Unity (Node 1)

December 1998

Flight 1R – Zvezda (Service Module)

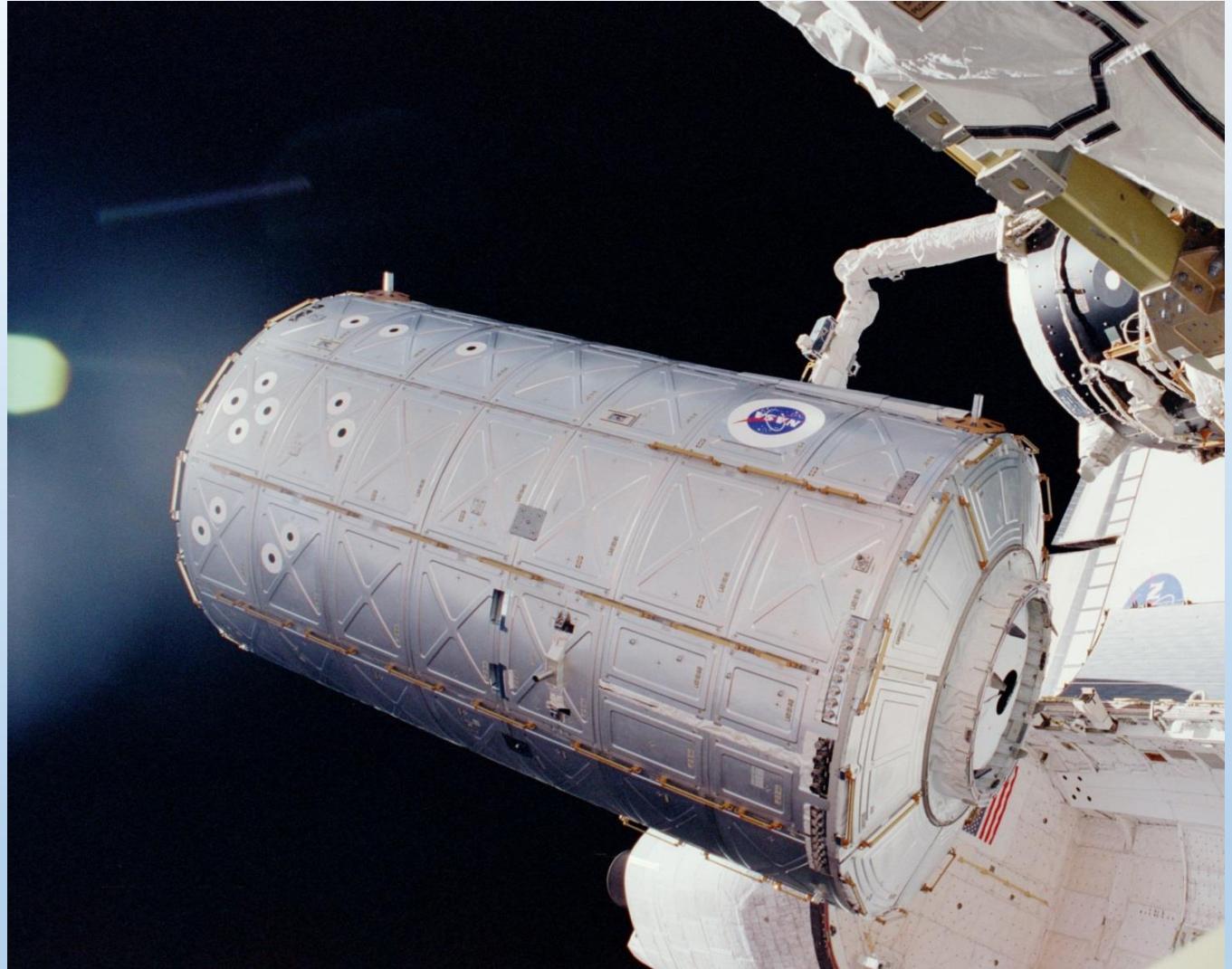
July 2000

Flight 4A – P6 Truss

December 2000

Flight 5A – Destiny Laboratory Module (US Lab)

February 2001



Construction

Flight 1A/R – Zarya (FGB)

November 1998

Flight 2A – Unity (Node 1)

December 1998

Flight 1R – Zvezda (Service Module)

July 2000

Flight 4A – P6 Truss

December 2000

Flight 5A – Destiny Laboratory Module (US Lab)

February 2001

Flight 6A – SSRMS

April 2001



Construction

Flight 1A/R – Zarya (FGB)

November 1998

Flight 2A – Unity (Node 1)

December 1998

Flight 1R – Zvezda (Service Module)

July 2000

Flight 4A – P6 Truss

December 2000

Flight 5A – Destiny Laboratory Module (US Lab)

February 2001

Flight 6A – SSRMS

April 2001

Flight 7A – Quest Airlock

July 2001



Construction

Flight 1J/A – JEM ELM-PS

March 2008

Flight 1J – JEM Pressurized
Module

May 2008

Flight 2J/A – JEM ELF

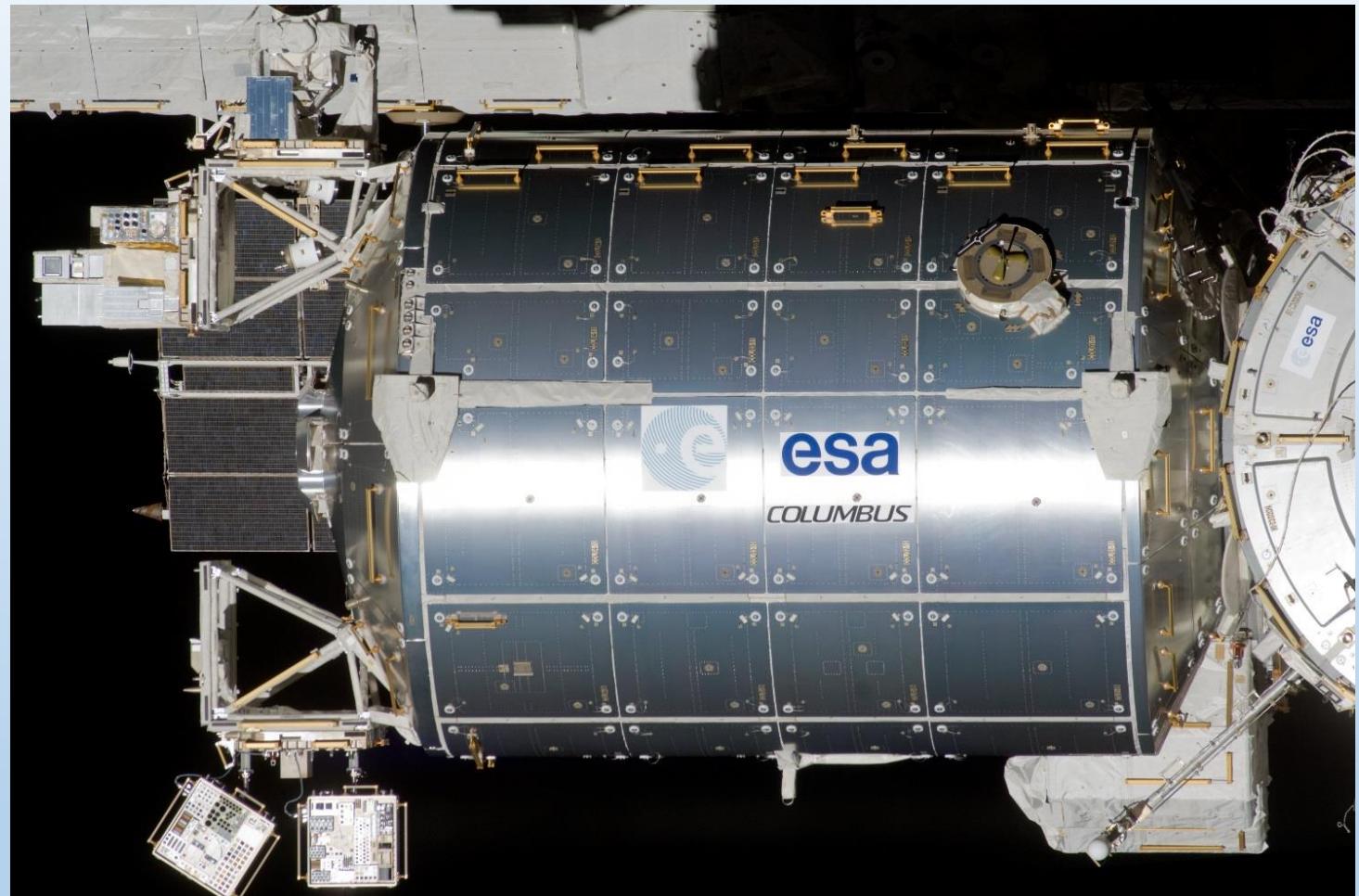
July 2009



Construction

Flight 1E – Columbus Module

February 2008



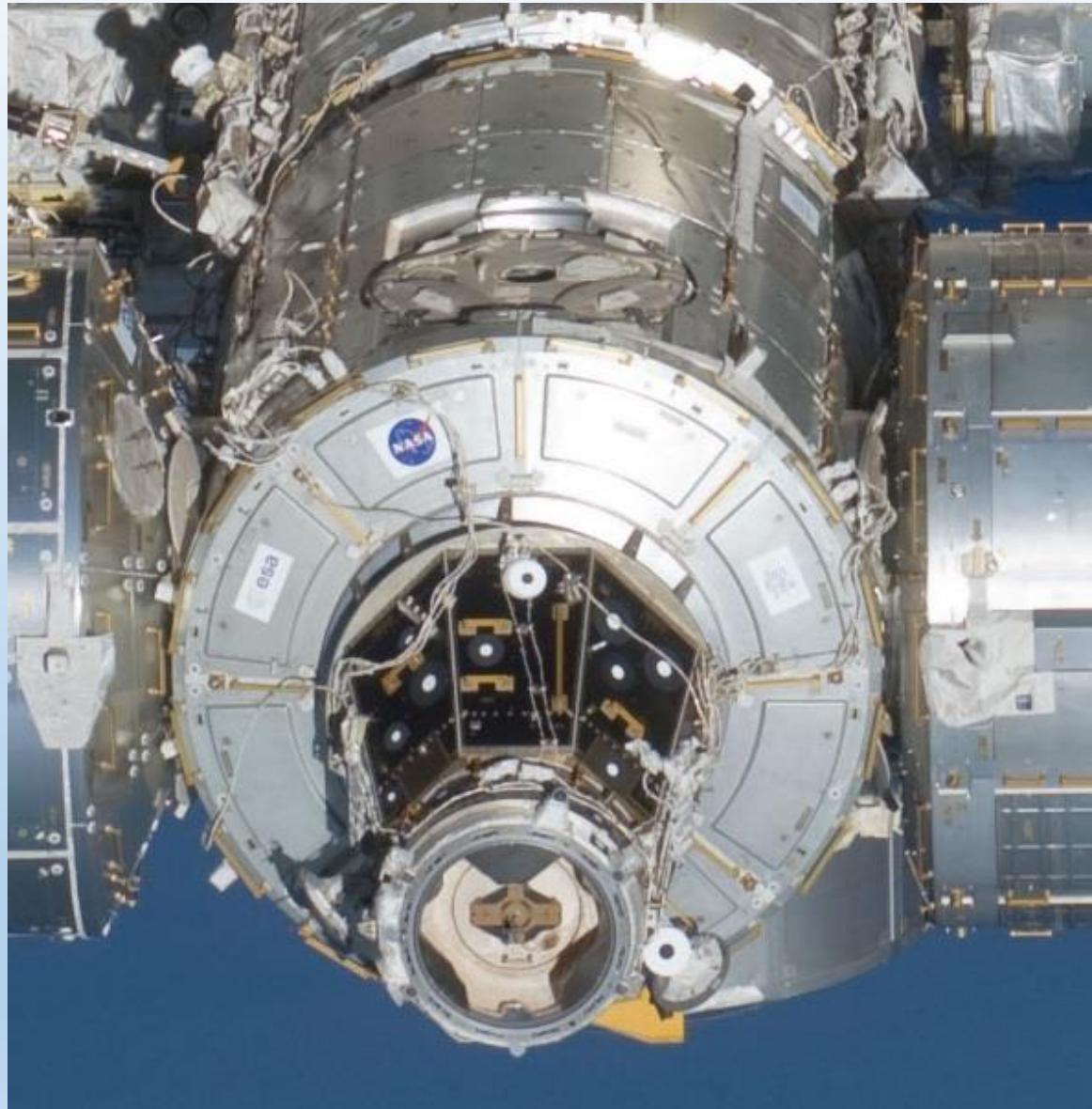
Construction

Flight 10A – Harmony (Node 2)

October 2007

Flight 1E – Columbus Module

February 2008



Construction

Flight 10A – Harmony (Node 2)

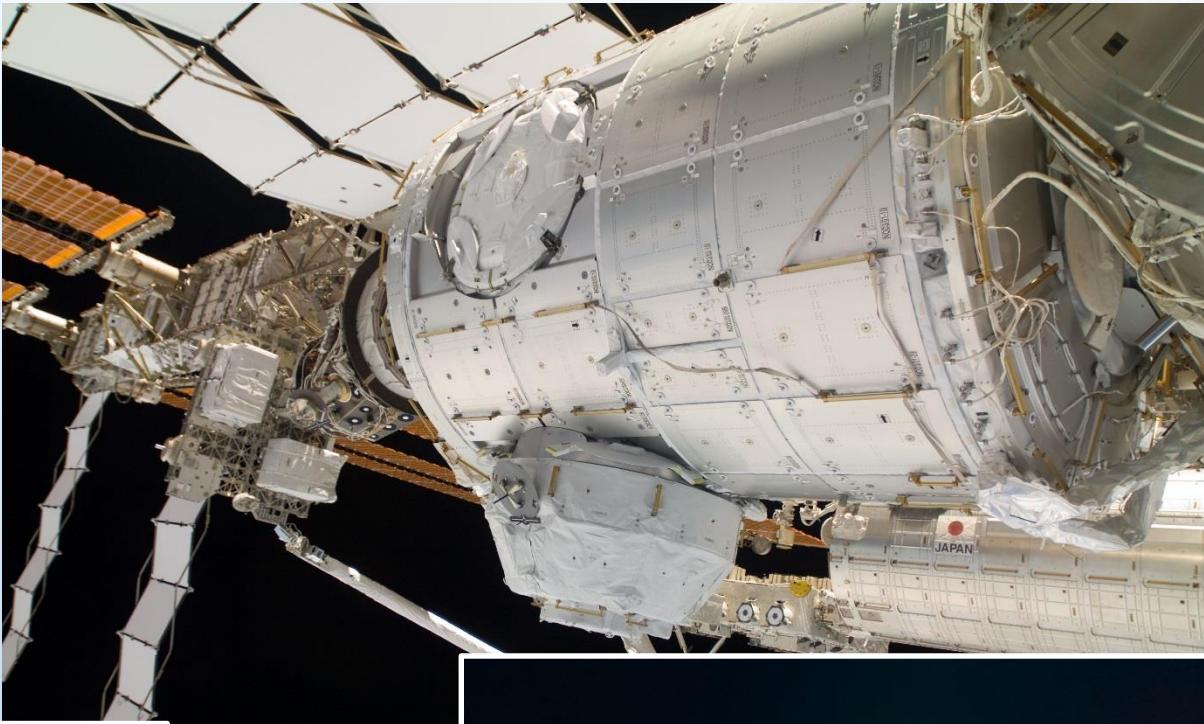
October 2007

Flight 1E – Columbus Module

February 2008

Flight 20A – Tranquility (Node 3)
& Cupola

February 2010



195 Spacewalks at the International Space Station



146
*Spacewalks in
U.S. Spacesuits*

49 Spacewalks
In Russian
Spacesuits



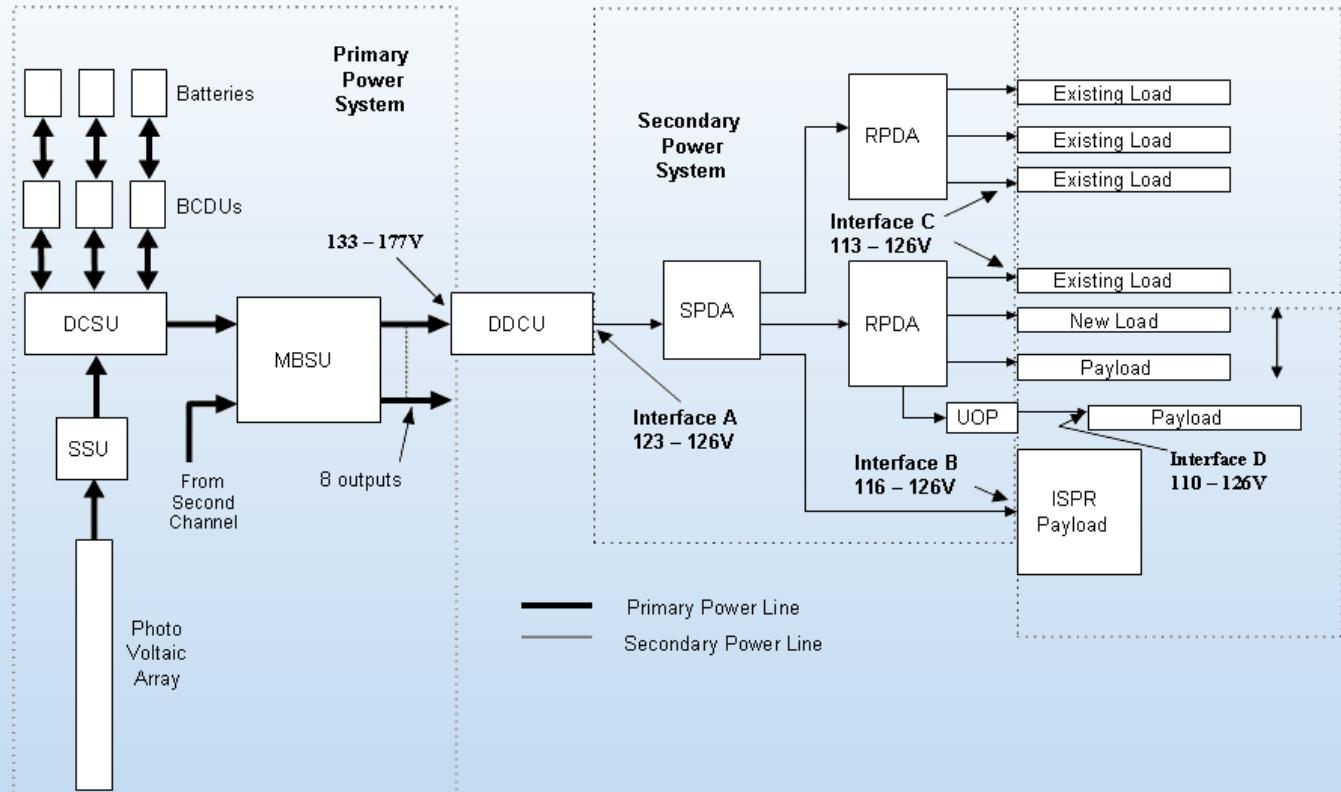
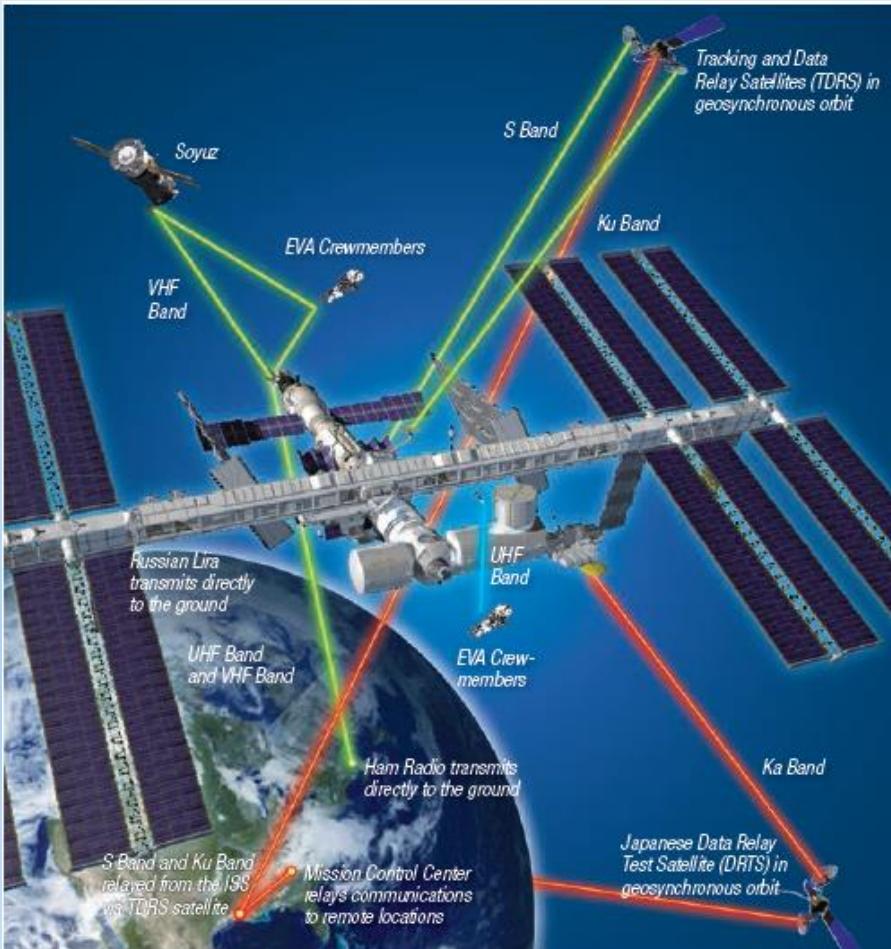
Extravehicular Activities

Total of 1212
hours, 10 min



Communications & Tracking – air-to-air and air-to-ground

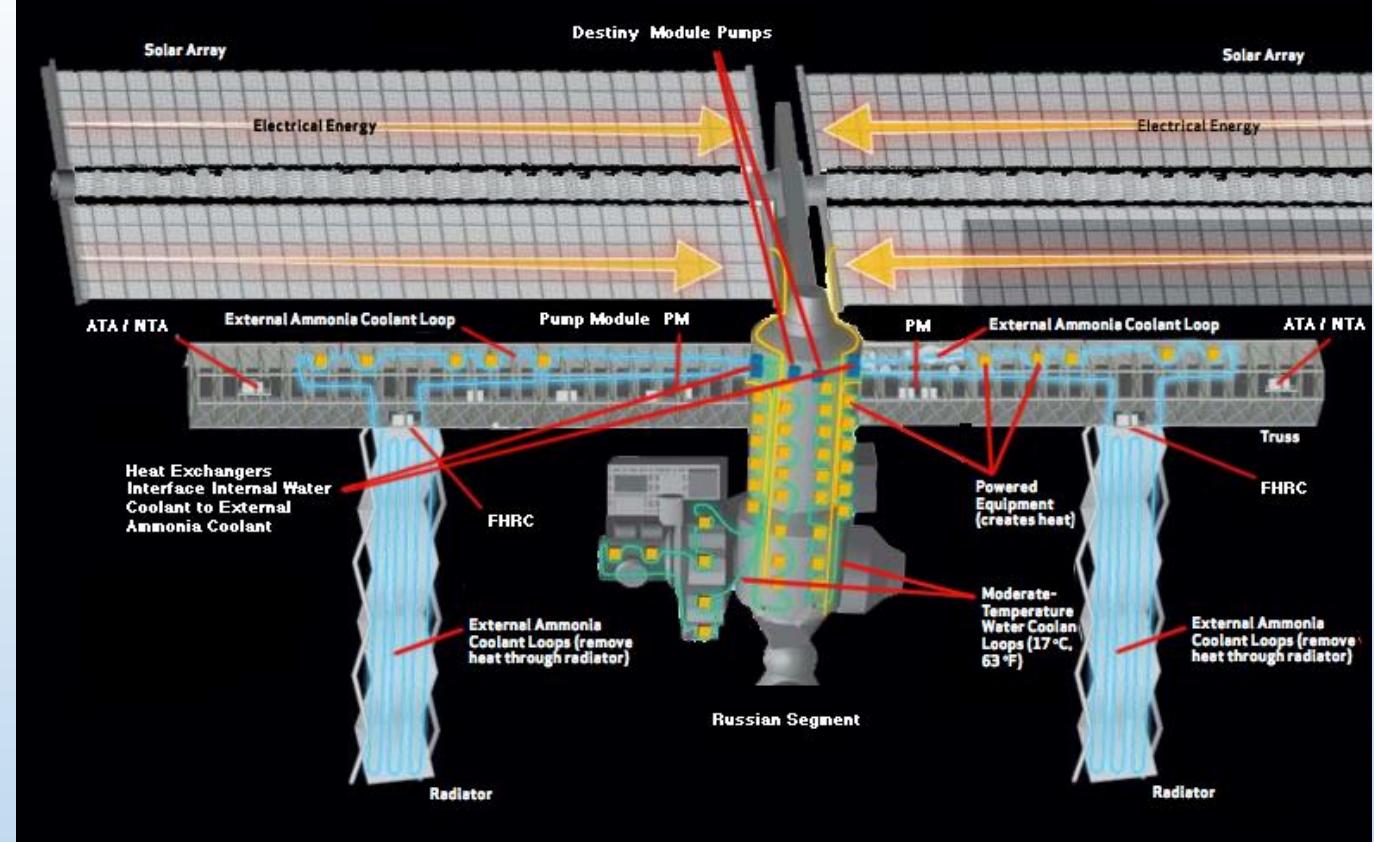
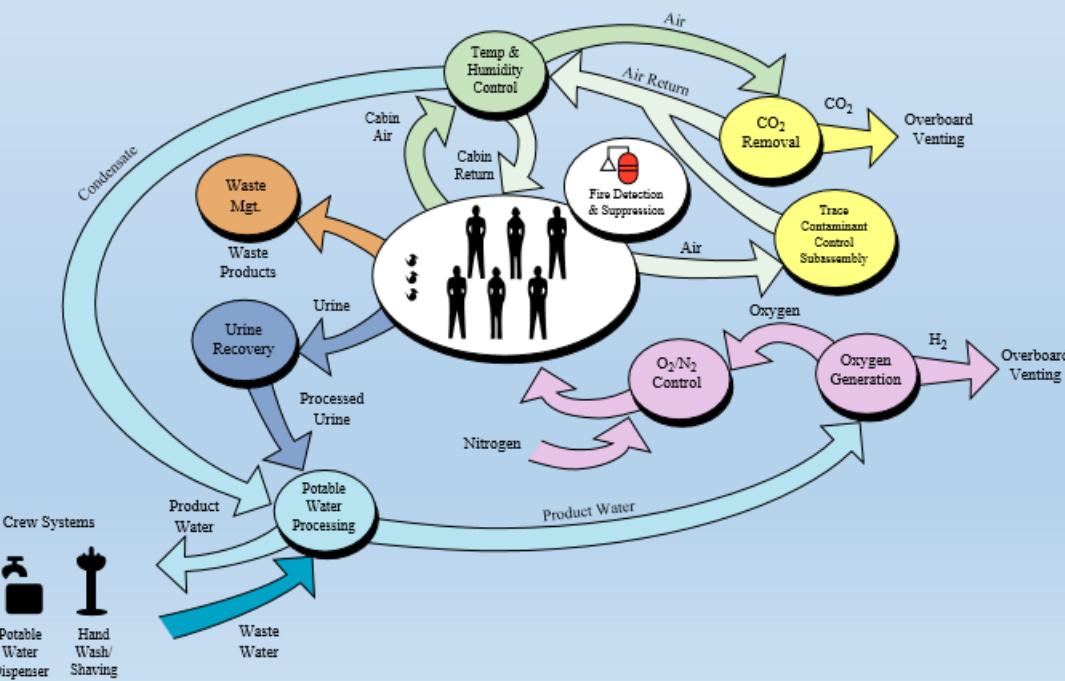
VHF, UHF, S-Band, Ku-Band, Ka-Band



Electrical Power System – 160 Vdc arrays converted to 120 Vdc and distributed to all modules

Environmental Control/Life Support System – semi-closed loop

Elektron O₂ generators
 CO₂ absorber system
 Water recovery system
 Potable water or O₂ generation



Thermal Control System –
 external radiators
 Ammonia coolant – external loop
 Water – internal loop

Expeditions

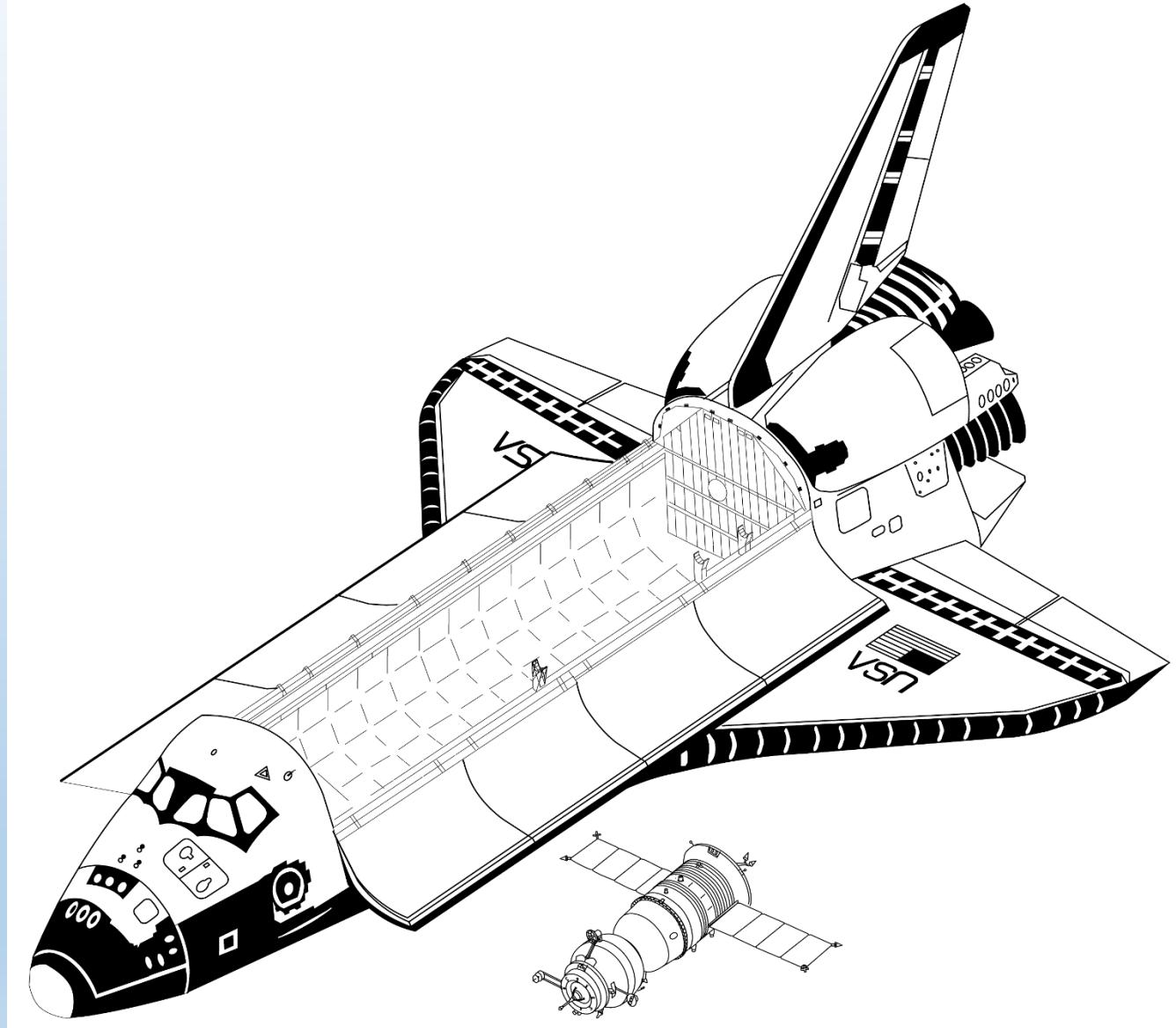
Expedition 1 began November 2000

Expedition 49 begins September 2016

16 Expeditions launched aboard Space Shuttle

Rest launched on Russian Soyuz







Expedition Highlights

Expeditions typically last 6 month

6 crew (typical) per Expedition
Crews staggered to overlap

Expedition 43/44 included one year mission

Scott Kelly and Mikhail Korniyenko

Expedition 16/STS-120

First time both ISS and STS had female commanders

Suni Williams (Ex 14) participated in Boston Marathon and Tim Peake (Ex 47) participated in London Marathon from ISS



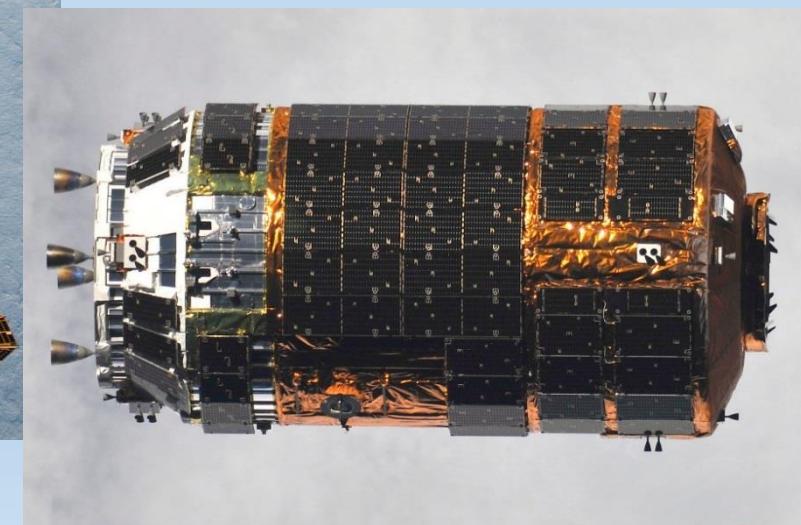
Cargo Delivery

Progress – 5,300 lbs capability

H-II Transfer Vehicle (HTV) –
10,400 lbs (pressurized) – 3,000
lbs (unpressurized) – 12,000 lbs
total

Orbital ATK Cygnus – 4,400 lbs
(standard) – 7,100 lbs (extended)

SpaceX Dragon – 7,300 lbs (up) –
5,500 lbs (return)



Daily Life

6 am Wake up

Breakfast – planning

~8 am Work Begins

Includes exercise time

~1 pm Lunch

One hour

Afternoon Work

Includes exercise time

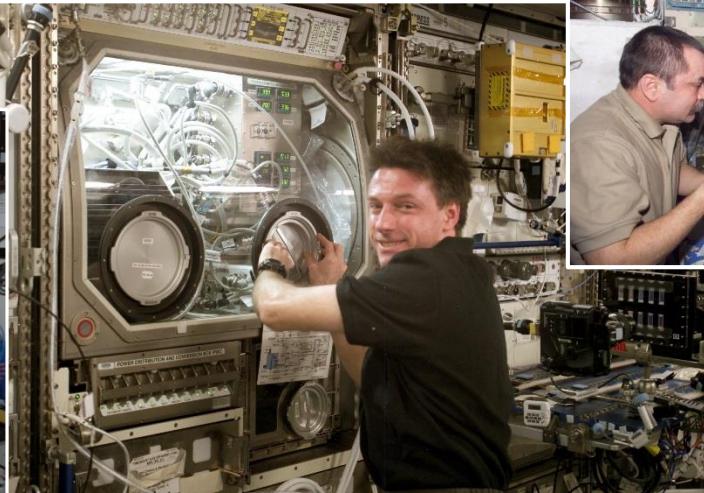
7:30 pm Pre-sleep

Includes supper

9:30 pm Sleep

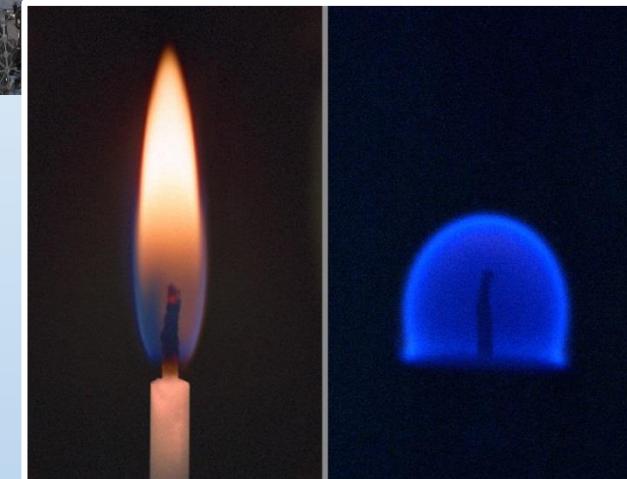
10 hr work days M-F

5hr work day Sat



ISS Science

Human Research
Space Medicine
Life Science
Physical Science
Astronomy
Meteorology



ISS Science - Internal

JEM - 9 Science Rack Locations

Columbus – 8 Science Rack Locations

US Laboratory – 12 Science Rack Locations

Payload Rack Facilities include

SAIBO

RYUTAI

MARES

Bio Lab

Human Research Facility

Express Rack

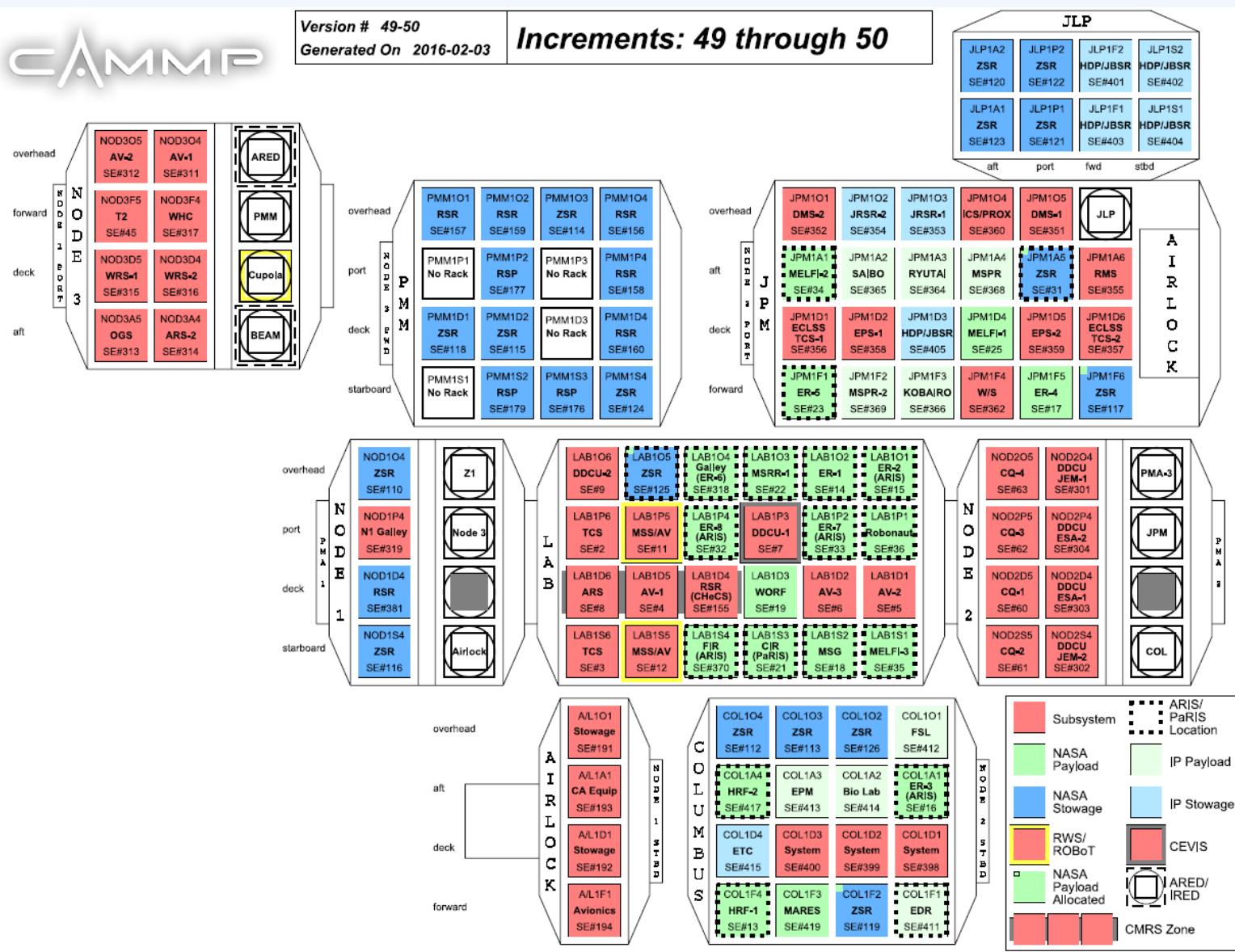
Combustion Integrated Rack

Fluids Integrated Rack

Window Observation Research Facility

Microgravity Science Glovebox

Microgravity Science Research Rack



ISS Science - External

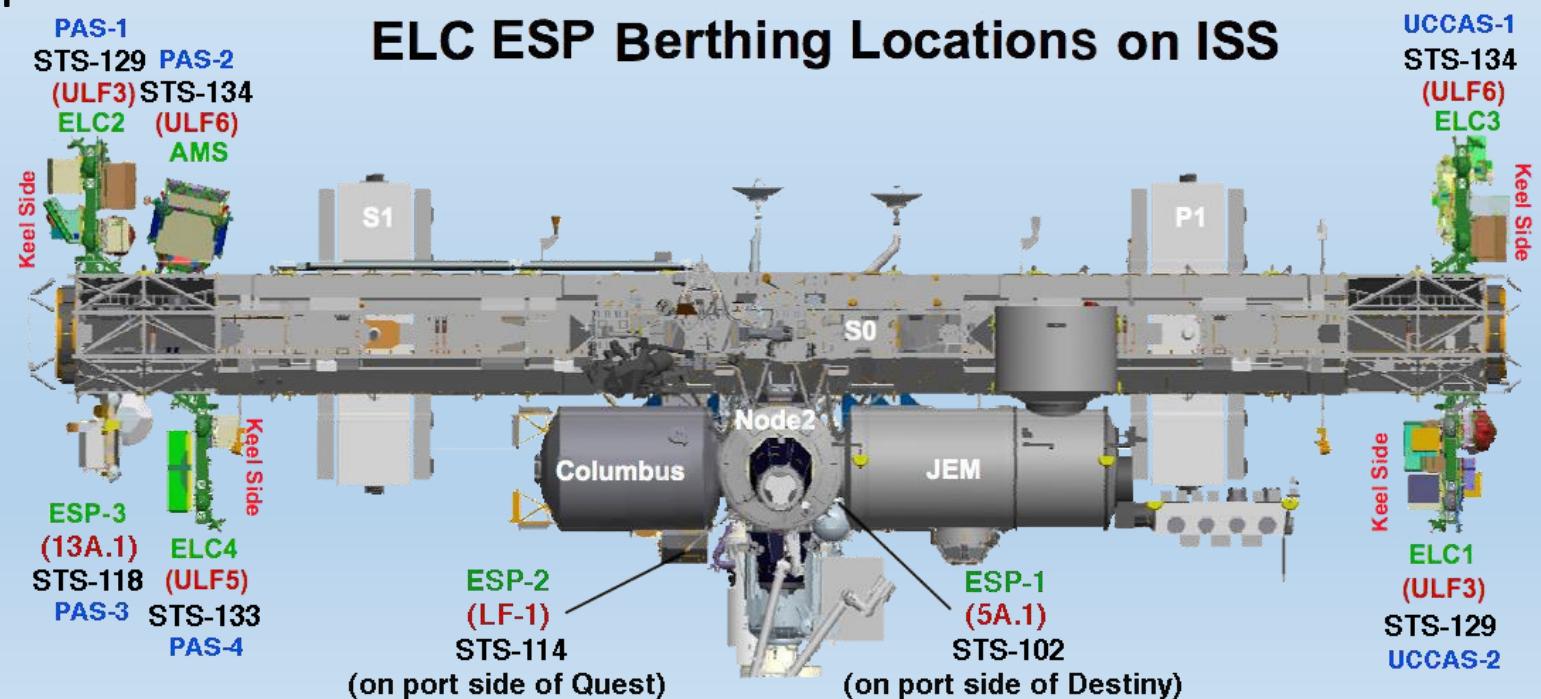
6 External payload locations on truss (ELC 1-4, ESP-3)

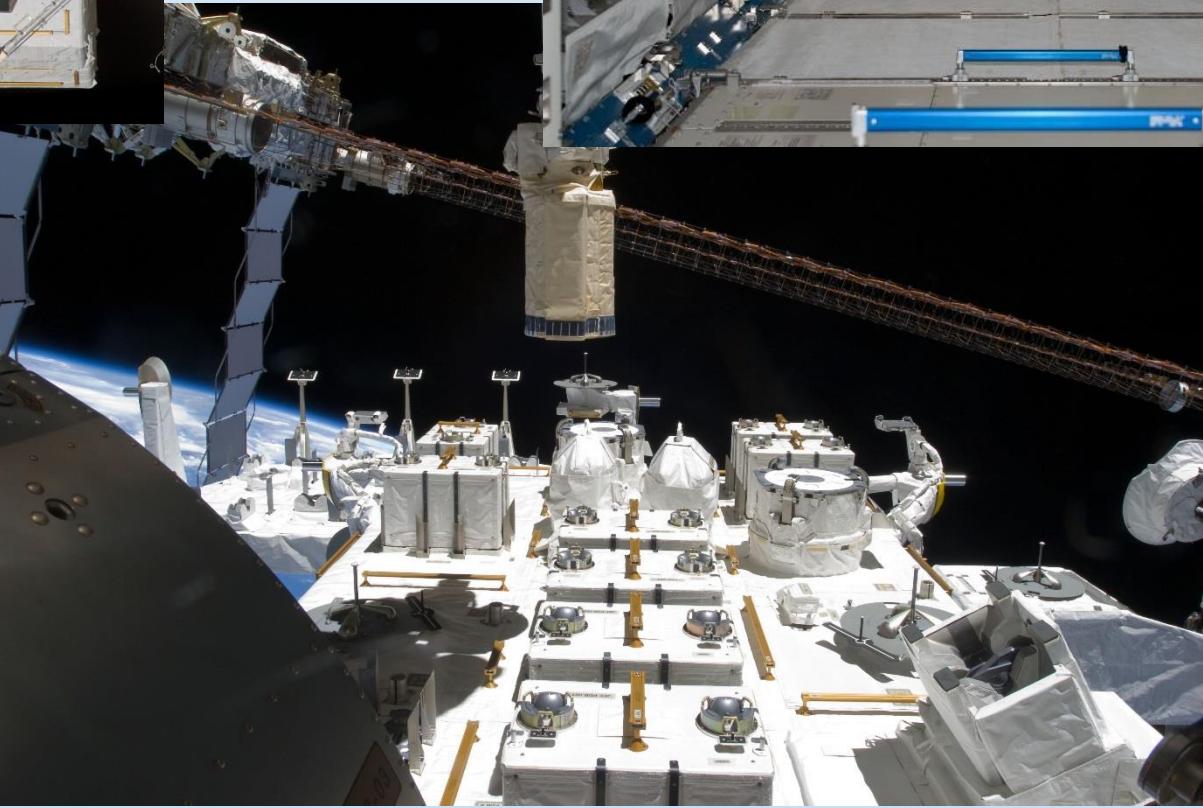
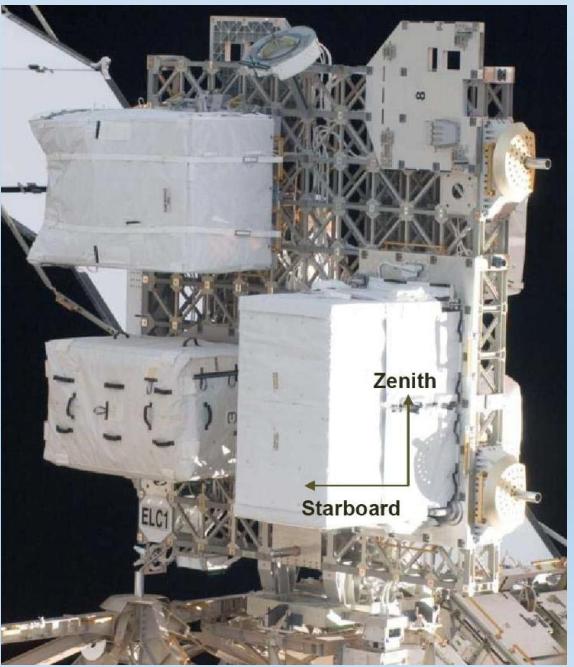
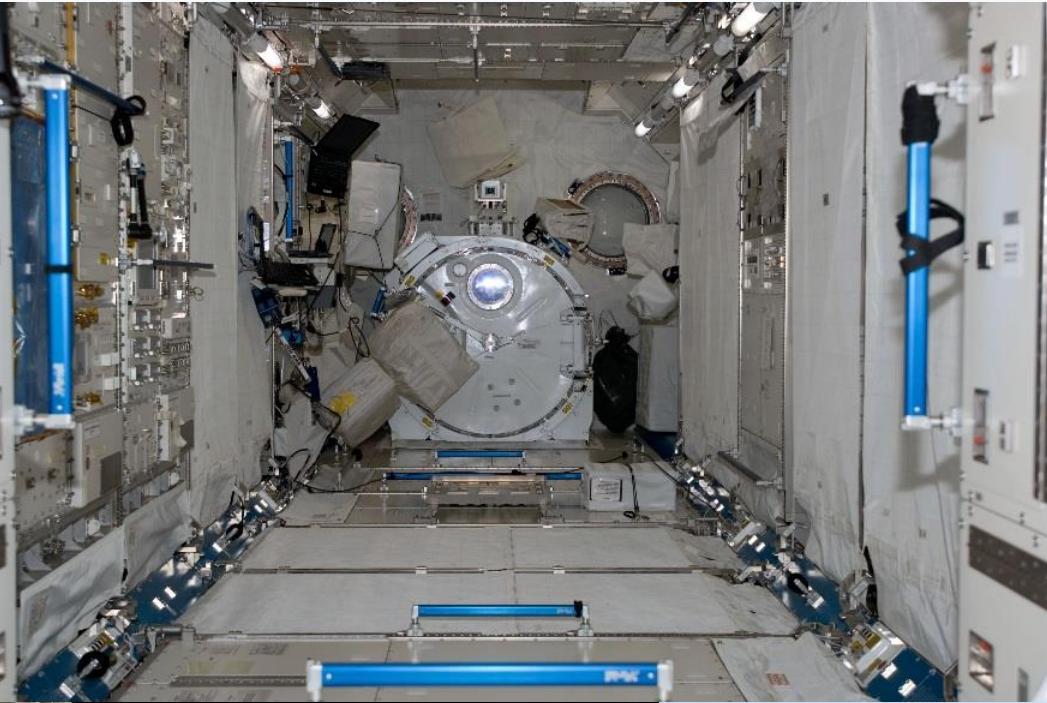
1 external platform on Destiny (ESP-1)

1 external platform on Quest (ESP-2)

4 platforms on Columbus (CEPF)

12 experiment locations on JEM-EF

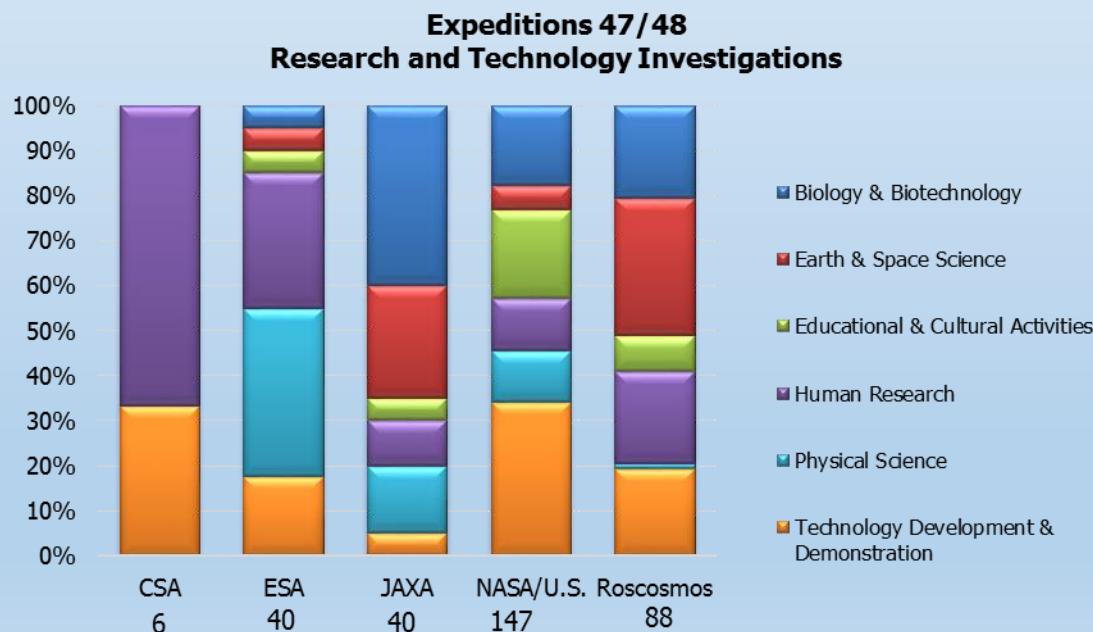






Number of Investigations for 47/48: 321

- 147 NASA/U.S.-led investigations
- 174 International-led investigations
- 103 New investigations
 - 1 CSA
 - 14 ESA
 - 9 JAXA
 - 76 NASA/U.S.
 - 3 Roscosmos (Preliminary Data)
- Over 800 Investigators represented
- Over 1300 scientific results publications (Exp 0 – present)



Estimated Number of Investigations Expedition 0-48: 2198*

Working data as of May 31, 2016

*Pending Post Increment Adjustments

HUMAN EXPLORATION

NASA's Path to Mars



EARTH RELIANT

MISSION: 6 TO 12 MONTHS
RETURN TO EARTH: HOURS



Mastering fundamentals
aboard the International
Space Station

U.S. companies
provide access to
low-Earth orbit

www.nasa.gov

PROVING GROUND

MISSION: 1 TO 12 MONTHS
RETURN TO EARTH: DAYS



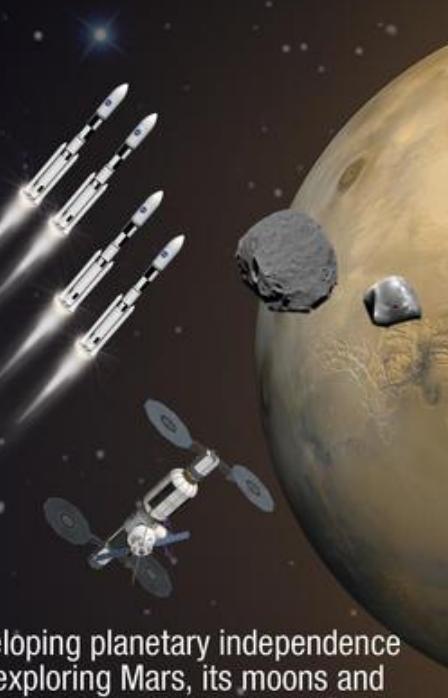
Expanding capabilities by
visiting an asteroid redirected
to a lunar distant retrograde orbit

The next step: traveling beyond low-Earth
orbit with the Space Launch System
rocket and Orion spacecraft



MARS READY

MISSION: 2 TO 3 YEARS
RETURN TO EARTH: MONTHS



Developing planetary independence
by exploring Mars, its moons and
other deep space destinations

ISS – serving as a testbed for human exploration as well as a premier orbiting laboratory

For more information

ISS on NASA.GOV

http://www.nasa.gov/mission_pages/station/main/index.html

ISS Research Blog “A Lab Aloft”

http://blogs.nasa.gov/ISS_Science_Blog/

ISS Research & Technology

http://www.nasa.gov/mission_pages/station/research/index.html

ESA

<http://www.esa.int>

JAXA

http://www.jaxa.jp/index_e.html

CSA

<http://www.space.gc.ca/asc/eng/default.asp>

RSA

<http://www.roscosmos.ru>